INTERNATIONAL STANDARDS FOR PHYTOSANITARY MEASURES

ESTABLISHMENT OF AREAS OF LOW PEST PREVALENCE FOR FRUIT FLIES (TEPHRITIDAE)

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CONTENTS

INTRODUCTION

SCOPE

This standard provides guidelines for the establishment and maintenance of areas of low pest prevalence for fruit flies (including places and sites of production of low pest prevalence) for use as a risk mitigation measure to facilitate trade of fruits and vegetables. This standard applies to fruit flies (Tephritidae) of economic importance.

REFERENCES

Agreement on the Application of Sanitary and Phytosanitary Measures, 1994. World Trade Organization, Geneva.
Determination of pest status in an area, 1998. ISPM No. 8, FAO, Rome.
Establishment of pest free areas for fruit flies (Tephritidae), 2006. ISPM No. 26, FAO, Rome.
Guidelines for pest risk analysis, 1996. ISPM No. 2, FAO, Rome.
Guidelines for surveillance, 1997. ISPM No. 6, FAO, Rome.
Guidelines on lists of regulated pests, 2003. ISPM No. 19, FAO, Rome.
International Plant Protection Convention, 1997. FAO, Rome.
Pest risk analysis for quarantine pests, including analysis of environmental risks and living modified organisms, 2004. ISPM No. 11, FAO, Rome.
Requirements for the establishment of areas of low pest prevalence, 2005. ISPM No. 22, FAO, Rome.
Requirements for the establishment of pest free places of production and pest free production sites, 1999. ISPM No. 10, FAO, Rome.
Trapping guidelines for area-wide fruit fly programmes, 2003. International Atomic Energy Agency, Vienna.

DEFINITIONS

Definitions of phytosanitary terms used in the present standard can be found in ISPM No. 5 (*Glossary of phytosanitary terms*).

For the purpose of country consultation, this section also contains terms or definitions which are new or revised in the present draft standard. Once this standard has been adopted, the new and revised terms and definitions will be transferred into ISPM No. 5, and will not appear in the standard itself.

New term and definition

target fruit fly species	Fruit fly species identified by the NPPO for a commodity intended to be traded or moved from an area, place or site of production.

ABBREVIATIONS USED IN THIS STANDARD

FF-ALPP	area of low pest prevalence for fruit flies
FF-PFA	pest free area for fruit flies
FFF-POP	fruit fly free place of production
FFF-PS	fruit fly free production site
FFLP-POP	fruit fly low prevalence place of production
FFLP-PS	fruit fly low prevalence production site
FTD	number of flies per trap per day
FTW	number of flies per trap per week

OUTLINE OF REQUIREMENTS

The general requirements for characterizing and utilizing an area of low pest prevalence for fruit flies (FF-ALPP) include:

- determination
- establishment
- verification and declaration
- maintenance.

For the establishment of the FF-ALPP, a parameter used to estimate fruit fly prevalence and the efficiency of trapping devices for surveillance should be determined. A table of levels used internationally is provided (Appendix 1). Surveillance, control measures and corrective action planning are required. Corrective action planning is described in Annex 1.

Additional requirements include the suspension, loss and reinstatement (if possible) of the status of the FF-ALPP, as well as documentation and review.

Detailed guidance on the use of regulatory control and preparation of a pest risk analysis is provided in the specific requirements for:

- FF-ALPPs that are established as buffer zones for pest free areas for fruit flies (FF-PFAs), fruit fly free places of production (FFF-POP) or fruit fly free production sites (FFF-PS)
- FF-ALPPs for export, usually associated with a systems approach.

BACKGROUND

Areas of low pest prevalence (ALPPs) are mentioned in the Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization (WTO-SPS Agreement) and the International Plant Protection Convention (IPPC, 1997). The concept and provisions of areas of low pest prevalence are addressed in ISPM No. 22 (*Requirements for the establishment of areas of low pest prevalence*) and may be used as part of a systems approach.

Areas of low pest prevalence for fruit flies (FF-ALPPs) may occur naturally, or may be artificially created by a National Plant Protection Organization (NPPO) to protect areas, places of production or production sites free of fruit flies. In other instances, FF-ALPPs are stages of a fruit fly eradication process.

The decision to create an FF-ALPP for export of a particular host of fruit fly is closely linked to trade opportunities and to economic and operational feasibility. An area can be defined as an FF-ALPP for one or more target fruit fly species; however, for export purposes, in most instances a specific systems approach based on such an FF-ALPP is required for the target fruit fly species. A case where this may not be necessary, however, is the movement of host fruit from one FF-ALPP to another FF-ALPP of the same pest status.

Advantages of implementing ALPPs for fruit flies may include:

- decreased pesticide usage
- increased fruit and vegetable production and quality
- promoting the use of biological control methods
- facilitation of trade if the fruit is pest free
- facilitation of transit of pest free fruit or other uninfested regulated articles through an FF-PFA.

REQUIREMENTS

1. General Requirements

1.1 Determination of an FF-ALPP

General procedures for determination of an ALPP are described in section 2.1 of ISPM No. 22 (*Requirements for the establishment of areas of low pest prevalence*). The following elements should also be considered for the determination of an FF-ALPP:

- target fruit fly species
- delimitation of the area.

1.1.1 Target fruit fly species

Before establishing an FF-ALPP, the target fruit fly species shall be identified.

1.1.2 Delimitation of the area

The NPPO should define the limits of a proposed FF-ALPP. In most cases, FF-ALPPs do not require isolation, either geographic or artificially created through a buffer zone; however, geographic isolation, if it is in place, would help to maintain the target fruit flies at a low prevalence level.

Boundaries should be closely related to the relative occurrence of major hosts of the target fruit flies. In practice, however, FF-ALPPs are generally delimited by readily recognizable boundaries, which may be administrative (e.g. country, province or community borders), geographic features (e.g. rivers, lakes, seas, mountain ranges or roads), protected areas (national parks, and forests) or property boundaries.

1.2 Procedures to establish an FF-ALPP

1.2.1 Establishment of the parameter used to estimate the level of fruit fly prevalence

Parameters used to determine the level of fruit fly prevalence in the FF-ALPP should be defined. The most widely used parameter is the number of flies per trap per day (FTD). This is usually expressed as an average of the total number of traps deployed in the whole area, but in order to have more precise data it may be presented spatially on the basis of trap density (i.e. FTD per unit area) or temporally for each trap present in an area over time (see *Trapping guidelines for area-wide fruit fly programmes*, IAEA/FAO- TG/FFP, 2003. IAEA, Vienna).

In some cases, such as an area where sterile insect technique (SIT) is applied or where no efficient attractant is available for the target fruit fly species, other parameters such as the number of larvae per

fruit, per weight or per sample may be used (see Appendix 2 of ISPM No. 26: *Establishment of pest free areas for fruit flies (Tephritidae*)).

The FTD is a population index used to estimate the average number of flies captured by one trap in one day. This parameter estimates the relative number of fruit fly adults in a given time and space. It is used as baseline information to compare fruit fly populations among different places and/or times.

The FTD value is the result of dividing the total number of captured flies by the product obtained from multiplying the total number of inspected traps by the average number of days the traps were exposed in the field. The formula is as follows:

$$FTD = \frac{F}{T \times D}$$

Where

F = total number of flies
T = number of inspected traps
D = average number of days traps were exposed in the field.

In cases where traps are regularly inspected on a weekly basis, the parameter may be "flies per trap per week" (FTW). It estimates the number of flies captured by one trap in one week. Thus, FTW is equivalent to sevenfold the FTD.

1.2.2 Determining the specified level of low prevalence

For every FF-ALPP a specified level of low prevalence should be determined. The level described by an FTD value or other parameter will very much depend on the level of risk associated with the target fruit fly species-host-area relationship. Thus the biology of the target fruit flies, including behaviour, reproduction and dispersion capacity, plays a major role.

If a FF-ALPP is intended for export, the specified level should be established in conjunction with the importing country. Usually higher parameter values are used for marginal or poor hosts of the target fruit flies species and lower parameter values are used for normal field hosts of the target fruit flies species.

Appendix 1 provides examples of FTD values that have been used internationally for a range of FF-ALPPs (varying in host, fruit fly and surveillance system).

1.2.3 Efficiency of trapping devices for surveillance

Other important elements that should be taken into account are the efficiency of the types of traps and attractants used to estimate the levels of the pest population and the procedures applied for servicing the traps. The rationale is that different trap efficiencies produce different FTD values at the same location, so that they have a significant effect in measuring the prevalence level of the target fruit fly species.

1.2.4 Surveillance system

Surveillance systems based on traps are similar in any type of fruit fly prevalence area. The surveillance used in an FF-ALPP may include those processes described in ISPM No. 6: *Guidelines for surveillance*, section 2.2.2 of ISPM No. 26: *Establishment of pest free areas for fruit flies (Tephritidae)*, and *Trapping guidelines for area-wide fruit fly programmes* (IAEA, 2003).

Host sampling as a routine surveillance process is not widely utilized for monitoring fruit flies in low prevalence areas except in areas where SIT is applied, where it can be a major tool.

In some cases, however, the NPPO may complement trapping with host sampling for fruit fly survey and/or monitoring, particularly for fruit flies that respond poorly to known attractants. In this instance, surveillance procedures may include those described in section 2.2.2.2 and Appendix 2 of the ISPM No. 26: *Establishment of pest free areas for fruit flies (Tephritidae)*.

The presence and abundance of major non-commercial fruit fly hosts should also be defined. This information will help in planning the trapping and host sampling activities and may help in anticipating the potential ease or difficulty of maintaining the phytosanitary status of the area.

Prior to the establishment of FF-ALPP, surveillance aiming at assessing the presence and abundance of the target fruit fly species should be undertaken for a period determined by climatic characteristics of the area and as technically appropriate for at least 12 consecutive months, aimed at assessing the presence and abundance of the target fruit fly species. Specific surveys carried out for a longer period will help in understanding the host sequence and seasonal and spatial distribution of the target fruit fly species in the area.

The NPPO should have identification capabilities for the target fruit fly species found during the surveys (whether adult or larvae) or have access to suitable specialists.

1.2.5 Control measures

In order to reduce fruit fly populations to or below the established level of low prevalence, specific phytosanitary procedures may be used. In most cases, suppression of fruit fly populations will involve the use of more than one control option. Since the target fruit fly species are permanently present in the area, preventive and/or long-lasting measures to maintain fruit flies at or below the specified level of low prevalence may be applied.

Phytosanitary measures to suppress fruit fly populations in FF-ALPPs include a number of preventive and/or corrective control methods, which may be selected and combined into a strategy for suppression. Available methods may include:

- chemical control (e.g. selective insecticide bait, aerial and ground spraying, bait stations and male annihilation technique using pheromones)
- biological control (e.g. natural enemies, SIT)
- cultural control, including:
  - orchard sanitation
  - replacement of wild host plants by non-host plants or tolerant varieties
  - destruction of mature fruit of wild hosts
  - rough pruning before the fructification period
  - removal of shade trees.

1.3 Verification and declaration of low pest prevalence

The NPPO verifies the fruit fly low pest prevalence status of the area (see ISPM No. 8: *Determination of pest status in an area*) by checking the compliance with the procedures set up in accordance with this standard.

In order to be able to verify the fruit fly low pest prevalence, FF-ALPP status should be continuously checked after the FF-ALPP has been established and phytosanitary measures for the maintenance of the FF-ALPP have been put in place.

Such verification may include:

- additional surveillance implemented for specific periods of time at a level of sensitivity that will ensure the detection of the target fruit fly species, if present, in accordance with the low pest prevalence level
- fruit sampling in field and local markets of major hosts, preferably at the beginning and end of the fructification seasons
- quality control of the routine surveillance and specimen identification processes.

The NPPO should officially declare the establishment of the FF-ALPP and notify trading partners as appropriate.

1.4 Maintenance of the FF-ALPP

1.4.1 Surveillance

In order to maintain the FF-ALPP status, the NPPO should engage in surveillance, as described in section 1.2.4.

1.4.2 Control measures

The NPPO should apply the control measures required to maintain the FF-ALPP as described in section 1.2.5. When the fruit fly low prevalence level is close to being reached, the NPPO may require implementation of additional control measures.

1.4.3 Corrective action plans

A corrective action plan for the FF-ALPP should be applied by the NPPO in the case of an outbreak of fruit flies. The corrective action plan should be based on the measures described in Annex 1.

1.5 Suspension, loss and reinstatement of FF-ALPP status

1.5.1 Suspension of FF-ALPP status

If the low pest prevalence level of the target fruit fly species is exceeded in a limited area that can be identified and isolated, then the FF-ALPP may be redefined to suspend that area. When such a suspension is put in place, the criteria for lifting the suspension and restoring the original FF-ALPP status should be made clear. Trading partners should be notified as appropriate of these actions.

In the case of a FF-ALPP that is a buffer zone for an FF-PFA, FFF-POP and/or FFF-PS, the suspension may also affect the pest free area, pest free place of production and/or pest free production site as appropriate.

1.5.2 Loss of status

Loss of FF-ALPP status should occur if the low pest prevalence level of the target fruit fly species is exceeded in the whole area or if critical failures in the procedures occur. Trading partners should be notified as appropriate of any change in FF-ALPP status.

In the case of a FF-ALPP that is a buffer zone for an FF-PFA, FFF-POP and/or FFF-PS, a loss of status of the ALPP may also affect the pest free area, pest free place of production and/or pest free production site as appropriate. Further guidance on PFAs for fruit flies is provided in ISPM No. 26 (*Establishment of pest free areas for fruit flies (Tephritidae)*).

1.5.3 Reinstatement

Reinstatement of FF-ALPP status may take place:

- in the case where the low pest prevalence level is exceeded, only after the conditions for establishment of the FF-ALPP have again been achieved
- in the case of faulty procedures, only when these have been rectified.

1.6 Documentation and review

1.6.1 Documentation

Determination, establishment, verification and maintenance of an FF-ALPP should be adequately documented and properly recorded. It is recommended that a manual of standard operational procedures, including quality control procedures, is prepared for the FF-ALPP. This should be reviewed and updated regularly.

For determination and establishment, documentation may include:

- delimitation records: (a) detailed maps showing the boundaries, natural barriers (if present) and entry points; (b) description of agricultural/ecological features such as the location of main host areas, marginal host areas and urban areas; and (c) climatic features
- surveillance records: types of surveys, number and type of traps and lures, trap density, trap arrays, amount of fruit sampled, number of target fruit flies captured by species for each trap
- record of control measures used: type(s) and locations.

For verification and maintenance, documentation may include the data recorded to demonstrate the population levels of the target fruit fly species.

1.6.2 Record keeping

Records should be kept for at least three years and should be accessible, as appropriate, for easy retrieval. Documentation should be made available on request.

1.7 Quality control

The NPPO should evaluate the operation of the procedures for establishment and maintenance of the FF-ALPP using quality control procedures. Critical elements in which quality control should be implemented include:

- operation of surveillance procedures
- trapping materials (traps, attractants)
- identification capability
- application of control measures
- record keeping
- implementation of corrective actions, where applied.

2. Specific Requirements

Two different categories of FF-ALPPs exist with different types of specific requirements:

- an ALPP set up as a buffer zone for an FF-PFA, FFF-POP or FFF-PS (either as a permanent buffer zone or as part of an eradication process)
- an ALPP set up for export purposes, usually in conjunction with other risk mitigation measures as a component of a systems approach. (This may include all or part of an FF-ALPP that acts as a buffer zone.)

2.1 An FF-ALPP as a buffer zone for an FF-PFA, FFF-POP or FFF-PS

In cases where the biology of the target fruit fly species is such that it is likely to disperse from an infested area into an FF-PFA, FFF-POP or FFF-PS, it is necessary to define a buffer zone with a low fruit fly prevalence (see ISPM No. 26: *Establishment of pest free areas for fruit flies (Tephritidae)* and ISPM No. 10: *Requirements for the establishment of pest free places of production and pest free production sites*). These FF-ALPPs are usually established at the time of setting up the FF-PFA, FFF-POP or FFF-PS.

2.1.1 Determination of an FF-ALPP as a buffer zone

Determining procedures may include those listed in section 1.1. In addition, in delimiting the buffer zone, detailed maps may be included showing the boundaries of the FF-PFA, FFF-POP or FFF-PS, location of major host areas, location of urban areas, entry points and control checkpoints, if they exist. It is also relevant to include data related to natural biogeographical features such as climate, location of valleys, plains, rivers, lakes and sea, and those areas that function as natural barriers. The size of the buffer zone in relation to the size of the area being protected will depend on the biology of the target fruit fly species (including behaviour, reproduction and dispersion capacity), the intrinsic characteristics of the FF-ALPP and of the FF-PFA, FFF-POP or FFF-PS, and on the economic and operational feasibility of establishing the FF-ALPP.

2.1.2 Establishment of an FF-ALPP as a buffer zone

The establishment procedures are described in section 1.2. In addition, regulatory controls may be applied.

2.1.2.1 Regulatory controls

In some cases, regulatory controls are required to regulate the movement into the area of host commodities of the target fruit fly species. Additional information can be found in section 2.2.3 of ISPM No. 26: *Establishment of pest free areas for fruit flies (Tephritidae).*

2.1.3 Maintenance of an FF-ALPP as a buffer zone

Procedures may include those listed in section 1.4. In the case of an FF-ALPP established as buffer zone to protect an FF-PFA, FFF-POP or FFF-PS, because it has features closely related to the area or place of production it protects, procedures for maintenance may include those listed for the FF-PFA, FFF-POP or FFF-PS as described in section 2.3 of ISPM No. 26: *Establishment of pest free areas for fruit flies*.

Sections 3.1.4.2, 3.1.4.3 and 3.1.4.4 of ISPM No. 22 (*Requirements for the establishment of areas of low pest prevalence*) also provide appropriate guidelines.

2.2 FF-ALPPs for export purposes

FF-ALPPs may be used to facilitate fruit and vegetable exports from the area. In most cases the FF-ALPP acts as a fruit fly low prevalence place of production (FFLP-POP) or fruit fly low prevalence production site (FFLP-PS) and is the main component of a systems approach as a pest risk mitigation measure supplemented by some other independent measure(s). An FF-ALPP acting as a stage of an eradication process may also be used for export purposes.

Examples of measures and/or factors used in conjunction with FF-ALPPs include:

- post-harvest treatments
- poor hosts / less attractive hosts
- varieties tolerant to the target fruit fly species
- import during restricted seasons
- physical barriers (e.g. pre-harvest bagging, insect-proof structures).

2.2.1 Determination of an FF-ALPP for export purposes

Determining procedures may include those listed in section 1.1. In addition, the following elements should be considered for the determination of an FF-ALPP:

- list of products (hosts) of interest
- additional information.

2.2.1.1 List of products (hosts) of interest

In the case of FF-ALPPs established for export purposes, the eligible products should be identified.

2.2.1.2 Additional information

When establishing an FF-ALPP for exporting purposes, there will be additional information requirements in relation to the proposed area. This relevant information may include:

- a list of other fruit fly species that may be present in the FF-ALPP
- a list of other commercial and non-commercial hosts of the target fruit fly species present but not intended for export and their level of occurrence, as appropriate
- any available historical records in connection with biology, occurrence and control of the target fruit fly species.

2.2.2 Maintenance of an FF-ALPP for export purposes

Maintenance procedures may include those listed in section 1.4. However, additional measures may be required to prevent the entrance of additional target fruit fly species into the FF-ALPP. Options to strengthen procedures include:

- physical and biological barriers, such as elimination of host plants that fructify at the same time as the host commodity around the places of production
- perimeter trap-hosts in the places of production
- elimination of alternate hosts around the places of production
- reduction in the number of trees that provide shelter to fruit flies around the FFLP-POP and FFLP-PS.

In this type of FF-ALPP, surveillance and control measures should be applied, if appropriate, throughout the fruiting seasons (pre-harvest and harvest) of the products (hosts) of interest. During the off-season period, however, if appropriate, a surveillance process may be applied intermittently. This will depend on the biology of the target fruit fly species and its relationship with the major hosts that fructify during the off-season.

ANNEX 1

GUIDELINES ON CORRECTIVE ACTION PLANS FOR FRUIT FLIES IN AN FF-ALPP[1]

The detection of an outbreak (i.e. a sudden significant increase of fruit fly population above the established low prevalence level) of the target fruit fly species in the FF-ALPP triggers a corrective action plan. The objective of the corrective action plan is to ensure suppression of the fruit fly to enable reaching the level of low prevalence as soon as possible.

The corrective action plan should be prepared taking into account the biology of the target fruit fly species, the geography of the FF-ALPP, climatic conditions, phenology and host distribution within the area.

The elements required for implementation of a corrective action plan include:

- criteria for the declaration of an outbreak
- time scales for the initial response and follow-up activities
- technical criteria for a delimiting survey (trapping and fruit sampling), and application of the suppression actions
- identification capability
- availability of sufficient operational resources
- effective communication within the NPPO and with the trading partner, including provision of contact details of all parties involved.

Actions to apply the corrective action plan

1. Declaration of an outbreak and first actions

The NPPO shall have a written document (the corrective action plan) to be used as a guideline and specific criteria to define an outbreak in an FF-ALPP and to decide on a course of action to be followed.

The NPPO might have a task force responsible for applying those measures delineated in the corrective action plan. The task force may be comprised of official and industry personnel; however, the NPPO shall be responsible for leading the actions. The task force shall meet immediately after an outbreak is declared.

2. Determination of the phytosanitary features of the outbreak

Immediately after the detection of an outbreak, a delimiting survey, which includes additional traps, and usually fruit sampling of major-host fruits, as well as an increased trap inspection rate, should be implemented to determine the size of the affected area and the level of the fruit fly prevalence.

3. Suspension and loss of FF-ALPP status

If the affected area is limited and can be isolated, the FF-ALPP may be redefined and the affected area is suspended.

If the affected area is so large that it might jeopardize the status of the whole FF-ALPP, the area shall be declared as infested and the status is lost.

4. Implementation of control measures in the affected area

Specific suppression actions should be immediately implemented in the affected area(s). Suppression actions may include:

- selective insecticide-bait treatments (aerial and/or ground spraying and bait stations)
- sterile fly release
- male annihilation technique
- collection and destruction of affected fruit
- stripping and destruction of major host fruits, if possible.

In the case of an FF-ALPP acting as a buffer zone for an FF-PFA, operation of quarantine checkpoints to prevent the movement of infested fruit from the affected area to a PFA should be immediately enforced. Other measures may be adopted if agreed by the importing country, for example, supplementary trapping.

[1] This annex is an official part of the standard.

5. Criteria for lifting the suspension or reinstatement of FF-ALPP status

The criteria for lifting the suspension and reinstatement of FF-ALPP status should be based on having the level of prevalence below the value established for as long as necessary. The time period will depend on the biology of the species and the environmental conditions[2].

Once the criteria have been fulfilled, normal surveillance levels and suppression actions are reinstated.

6. Notification of relevant agencies

Relevant NPPOs and other agencies should be kept informed of corrective actions as appropriate.

[2] The period starts from the last detection. For some species, for lifting of suspension no further detection should occur for one biological cycle of the pest, and for re-instatement no further detection should occur for two biological cycles. However the required period should be based on scientific information including that provided by the surveillance systems in place.

APPENDIX 1

EXAMPLES OF FTD VALUES USED AS LOW PEST PREVALENCE FOR FRUIT FLIES[3]

Examples from a range of international scenarios illustrating the determination of low levels of fruit fly prevalence measured in flies per trap per day (FTD)[4]

Target pest	Scenario			Trap type	Attractant	Trap density (trap/km^2)	Inspection period (days)	FTD values/ area specified
	Use of the ALPP	Host of interest	Period					
ALPP used as buffer zone								
Ceratitis capitata	Protecting FF-PFA	All	Throughout the year	Jackson	TML	0.25–1.0	7–14	0.1/zone
Ceratitis capitata	Protecting FFF-POP/PS	Peppers	Pre-harvest and harvesting season	Jackson	TML	4–10	7	0.1–0.001/ surrounding area
Ceratitis capitata	Protecting FFF-POP/PS	Tomatoes	Pre-harvest and harvesting season	Jackson	TML	4–10	7	0.1–0.001/ surrounding area
Ceratitis capitata	Protecting FFF-POP/PS	Papaya	Throughout the year	Jackson	TML	2	14	0.001/surrounding area
ALPP used for export purposes								
Ceratitis capitata	In combination with post-harvest treatment	Clementines/ Oranges	Pre-harvest and harvesting season	Jackson	TML	0.7	7	< 0.5/orchard
Anastrepha obliqua	In combination with post-harvest treatment	Mango	Pre-harvest and harvesting season	McPhail	Protein bait	100	7	0.01/orchard
Anastrepha ludens and *Anastrepha* spp.	In combination with post-harvest treatment	Orange, grapefruit and tangerine	Throughout the year	McPhail	Protein bait	20	7	0.07–0.1/orchard
Anastrepha ludens, A. serpentina, A. striata	In a systems approach	Avocado	Throughout the year	McPhail	Protein bait	10	7	0.01/orchard
Ceratitis capitata, Anastrepha ludens, A. obliqua, A. striata, A. fraterculus and *A. serpentina*	In a systems approach	Pitahaya	Pre-harvest and harvesting season	Jackson and McPhail	TML and protein bait	100	7	0.07/orchard
Ceratitis capitata and *Anastrepha* spp.	In combination with post-harvest treatment	Papaya	Throughout the year	Jackson and McPhail	TML and protein bait	50 and 50	7	1.00/orchard
Ceratitis capitata and *Anastrepha* spp.	In combination with post-harvest treatment	Mango	Pre-harvest and harvesting season	Jackson and McPhail	TML and protein bait	10 and 10	7	< 1

ALPP = area of low pest prevalence; FF-PFA = pest free area for fruit flies; FFF-POP/PS = fruit fly free place of production/production site; TML = trimedlure.

[3] This appendix is not an official part of the standard. It is provided for information only.
[4] Information given in the table was taken from bilateral protocols set up by various countries.